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(54) [Title of Invention]
FLUORESCENCE OBSERVATION APPARATUS

(57) [Abstract]
[Purpose]
To provide a fluorescence observation apparatus wherein removal of an apparatus such as a camera is unnecessary and the labor is saved and both an endoscope image and a fluorescence image can be obtained.

[Constitution]
Normal light or excitation light selected by an introduced-light switching adapter 5 is emitted to a subject area to be observed from a light guide 12 of an endoscope 2. The image of the normal light or a fluorescence image based on the excitation light is introduced to an external camera 6 from an image guide 11. A rotatable filter 23 is rotated in synchronization with the switching operation of said light source, and normal light and fluorescence light having wavelength bands λ_1 and λ_2 are transmitted, in a time divided manner, by filters 31 and 32 provided on this rotatable filter 23, and entered to a solid-state image detecting device 22 which captures an observation image by normal light and a fluorescence image by excitation light in a time-divided manner.

[Claims]
[Claim 1]
A fluorescence observation apparatus by which an normal observation image by illumination light and a fluorescence image by excitation light can be detected selectively or in time-divided manner, which is characterized by having:
an endoscope containing a light transmitting means transmitting light to irradiate an area to be observed

and an image transmitting means transmitting the images obtained by light from the light transmitting means reflected by the area to be observed;
a normal observation light generating means which emit normal illumination light for performing a normal endoscope observation;
a fluorescence observation light generating means for emitting excitation light for performing a fluorescence observation;
an introduced-light switching means which selectively supplies the normal illumination light from the aforesaid normal observation light generating means and the excitation light from the aforesaid fluorescence observation light generating means;
a wavelength selecting means which selectively passes through or transmits light having at least one of the wavelength bands of the aforesaid normal illumination light that is transmitted by the aforesaid image transmitting means or light having at least one of the wavelength bands obtained from the fluorescence generated by the aforesaid excitation light that is transmitted by the aforesaid image transmitting means to an area to be observed;
a control means which controls to switch between the aforesaid normal observation light and the aforesaid excitation light of the said introduced-light switching means as well as controls that light transmitted by the aforesaid image transmitting means by the aforesaid wavelength selecting means to pass through or transmit selectively in synchronization with the switching operation; and
one image detecting means for detecting images after receiving the light having the wavelength bands pass through or transmitted selectively by the aforesaid wavelength selecting means.

[Detailed explanation of the invention]
[0001]
[Filed of the Invention]
This invention relates to a fluorescence observation apparatus which can detect an observation image by normal light and an observation image by fluorescence light emitted from an area to be examined by irradiating the excitation light for the use of diagnosing a lesion.

[0002]
[Prior Art]
In recent years, there are techniques such as auto-fluorescence generated from living tissue and drug-induced fluorescence generated by injecting a fluorescent drug into the organism beforehand and produce two-dimensional images which are used to diagnose the degeneration of tissues of the organism or a state of the disease (for example, the type of the disease or the extent of infiltration), such as cancer.

[0003]
If light is irradiated to living tissue, the fluorescence of a wavelength longer than that of the excitation light will be emitted.
Fluorescence substances in the organism are, for example, collagen, NADH (nicotinamide adenine dinucleotide), FMN (flavin mononucleotide), pyridine nucleotide, etc. Recently, the interrelation between these substances in the organism emitting fluorescence light and diseases is becoming clear, and the diagnosis of cancer, etc. is possible from this fluorescence.
Alternatively, a fluorescence substance such as HpD (hematoporphyrin), Photofrin, ALA (δ-amino levulinic acid), etc., may be injected into an organism. These substances have a tendency to accumulate in cancerous tissue, and a diseased area can be diagnosed by observing the fluorescence after injecting any of these substances into an organism.

[0004]
By the way, said fluorescence is extremely weak and it requires a supersensitive photography for its observation. Image intensifiers are well known for this supersensitive photography. Recently, a technique to increase sensitivity has been suggested which performs two-dimensional synchronizing detection.

[0005]
On the other hand, as for fluorescence observation, an observation of normal screen is also very important in the point of view of identifying a location of a lesion or orientation other than fluorescence image. In addition, in prior art example, several cameras are used for photography in order to photograph both a fluorescence image and a normal image.

[0006]
[Problems to be Solved by the Invention]
The aforesaid fluorescence observation is applied to an endoscope apparatus, that is; using an apparatus to perform fluorescence observation using an endoscope, a means to acquire a normal endoscope image and a supersensitive image detecting device are needed. When switching between a normal observation image and a fluorescence image, there are faults that taking time to install/remove an apparatus such as camera and an apparatus will be big.

[0007]

This invention is formed in considerations of the above-mentioned matters and aimed to provide a fluorescence observation apparatus which can obtain both an endoscope image and a fluorescence image and the labor is saved by not requiring to install/remove on/from an apparatus such as camera.

[0008]
[Means to Solve Problems]
A fluorescence observation apparatus of this invention by which an observation image by normal illumination light and a fluorescence image by excitation light can be detected selectively or time divided manner, comprises:
an endoscope containing a light transmitting means transmitting light to irradiate an area to be observed and an image transmitting means transmitting the images obtained by light from the light transmitting means reflected by the area to be observed;
a normal observation light generating means which emit normal illumination light for performing a normal endoscope observation;
a fluorescence observation light generating means for emitting excitation light for performing a fluorescence observation; and
an introduced-light switching means which selectively supplies the normal illumination light from the aforesaid normal observation light generating means and the excitation light from the aforesaid fluorescence observation light generating means.

[0009]
The fluorescence observation apparatus of this invention further comprises:
a wavelength selecting means which selectively passes through or transmits light having at least one of the wavelength bands of the aforesaid normal illumination light that is transmitted by the aforesaid image transmitting means or light having at least one of the wavelength bands obtained from the fluorescence generated by the aforesaid excitation light that is transmitted by the aforesaid image transmitting means to an area to be observed;
a control means which controls to switch between the aforesaid normal observation light and the aforesaid excitation light of the said introduced-light switching means as well as controls that light transmitted by the aforesaid image transmitting means by the aforesaid wavelength selecting means to pass through or transmit selectively in synchronization with the switching operation; and
one image detecting means for detecting images after receiving the light having the wavelength bands pass through or transmitted selectively by the aforesaid wavelength selecting means.

[0010]
[Effect]
According to the structure of this invention, the normal observation light or the excitation light selected by the introduced-light switching means based on the control of the control means is transmitted by the light transmitting means of the endoscope and irradiates an area to be examined.

[0011]
In addition, the wavelength selection means based on the control of the aforesaid control means, the normal observation light or fluorescence transmitted by the aforesaid image transmitting means is transmitted or passed through by synchronizing with the switching control between the normal light and the excitation light, and turns into the light with at least one part of the wavelength band of the normal illumination light or the light with at least one part of the wavelength band of the fluorescence and incident to one of the image detecting means. After receiving the incident light, the aforesaid image detecting means images a normal observation image by the normal observation light and a fluorescence image by the excitation light.

[0012]
[Embodiments]
Embodiments of this invention will be explained below with reference to the drawings. Fig. 1 through Fig. 4 relate to a first embodiment of this invention. Fig. 1 is an overall structure of a fluorescence observation apparatus. Fig. 2 is a characteristic graph which illustrates an example of the distribution of fluorescence light intensities in an area to be observed in tissue of an organ. Fig. 3 is an explanatory drawing showing the relationship between the transmission characteristics of RGB filter and the wavelengths λ_1 and λ_2. Fig. 4 illustrates a structure of a rotatable filter.

[0013]
The fluorescence observation apparatus in Fig. 1 comprises:
a fiber-type optical endoscope 2;
a normal observation light source apparatus 3 for generating normal endoscope observation light to the endoscope 2;
a fluorescence observation light source apparatus 4 for generating He-Cd laser light for example serving as excitation light to perform a fluorescence observation;
an introduced-light switching adapter 5 which selectively supplies light from said normal observation light source apparatus 3 and said

fluorescence observation light source apparatus 4 to the endoscope 2; and
an external camera 6 which is connected to the ocular part (described later) of the said endoscope 2.
In addition, said fluorescence observation light source apparatus 4 could be a dye laser, a krypton laser, an excimer laser, etc. and it is not specified. For example, excitation light of 350–500nm wavelengths is generated; however, it is not restricted to that as long as serving as a means to generate excitation light for generating fluorescence light.

[0014]
The fluorescence observation apparatus 1 comprises:
a CCU (a camera control unit) 7 which processes the images from the endoscope detected by said external camera 6 and a fluorescence image processing apparatus 8 for acquiring a fluorescence observation image by applying the calculation process to the images obtained by said CCU 7.
It further comprises:
a control unit 9 which controls said introduced-light switching adapter 5 and said external camera 6 and enables to superimpose each image output of said CCU 7 and said fluorescence mage processing apparatus 8; and
a monitor 10 for displaying the output image from said control unit 9.

[0015]
The said endoscope 2 comprises the insertion part 13 in which an image guide fiber 11 serving as an image transmitting means and a light guide 12 serving as a light transmitting means are inserted, and a universal cord 15 which is extended from the side part of the operating part 14 and inserts the light guide 12 through. The universal cord 15 is connected to said introduced-light switching adapter 5 and said light guide 12 transmits illumination light to the distal part of the insertion part 13. An endoscope image is transmitted to the external camera 6 from the emission end of the image guide fiber 11 that is arranged on the ocular part 16 of the endoscope 2.

[0016]
The normal observation light source 3 in which a xenon lamp 17 for example is arranged as a normal observation light generating means and supplies the normal observation light emitted from this lamp 17 to the introduced-light switching adapter 5 via an optical system 18. The fluorescence observation light source apparatus 4 contains a solid-state laser source such as a semiconductor serving (not illustrated) as a fluorescence observation light generating means.

The fluorescence observation light generating means is not limited to the solid-state laser source but a gas laser may be employed.

[0017]
The switching mirror 20 of the introduced-light switching apparatus is arranged at the point of intersection of normal observation light emitted by the normal observation light source apparatus 3 and laser light emitted by the fluorescence observation light source apparatus 4 transmitted by the light guide 19. That is, said normal observation light and said laser light are arranged to intersect each other perpendicularly at the switching mirror 20. The switching mirror 20 is switched by the driver 21 to be inserted or removed from the optical path connecting the light guide 12 of the endoscope side and the light guide 19 of the laser side. Normal observation light of the lamp 17 and laser light from the fluorescence observation light source 4 are switched by this structure so as to supply them to the light guide 12 of the endoscope.

[0018]
The external camera 16 consists of a solid-state image detecting device 22 serving as an image detecting means which consists of CMD (charge modulation device) for example that detects the image transmitted by the image guide fiber 11 via an optical system 28, a rotatable filter 23 serving as the wavelength selection means which has plural filters having different band widths attached on the optical path of the solid-state image detecting device 22 and the image guide fiber 11, and a motor 23 serving as a wavelength selecting means which rotates the rotatable filter 23.
The timing of reading the solid-state image detecting device 22 is controlled by the CCU 7. Note that the reading timing can be controlled by a timing controller 26 to be described later. As the solid-state image detecting device such as a charge-coupled device, a static induced transistor or a MOS may be employed.

[0019]
The output photoelectrically converted by the solid-state image-detecting device 22 is supplied to the CCU 7 where the normal image processing is carried out. The output of the CCU 7 is supplied to an image processing circuit 8' [Note: a number 24 is used in the original document, however, this number is used for expressing a motor.] of the fluorescence image processing apparatus 8 and the calculation process is applied to the image obtained by CCU7 by the image processing circuit 8' so as to acquire a fluorescence observation image.

[0020]
The image output of the CCU 7 and the fluorescence observation image of the image processing circuit 8' are superimposed by the superimpose circuit 25 of the control unit 9 and displayed on the monitor 10.

[0021]
On the other hand, the control unit 9 has a timing controller 26 serving as a control means. The timing controller 26 controls the motor 24 of the external camera 6 and the driver 21 of the introduced-light switching adapter 5. That is, this timing controller 26 controls the switching timing of illumination light by the switching mirror 20 and the switching timing of plural band width filters on the rotatable filter 23. The motor 24 is synchronously controlled with the switching mirror 20 of the adapter 5 by the timing controller 26 and the rotatable filter 23 is switched.

[0022]
The image processing timing of the CCU 7 and the processing timing of the super impose circuit 25 controlled by the timing controller are synchronized with the processing timing of the image processing circuit 8' controlled by the timing controller 27 of the fluorescence image processing apparatus 8.

[0023]
Fig. 2 shows the fluorescence characteristics when excitation light λ_0 is irradiated. The fluorescence of tissue acquired with the excitation light at 442 nm is stronger in intensities in a normal area and weak in a short wavelength side in a diseased area. That is, the ratio of fluorescence intensities in λ_1 and λ_2 and a normal area and a diseased area differ so that by calculating the ratio of λ_1 and λ_2, a lesion and a normal can be distinguished. A sample wavelength is not at λ_1 and λ_2 but could be more than three.

[0024]
Fig. 4 shows an example of the rotatable filter 23. Fig. 4 (a) is a rotatable filter 23 which uses a single-plate color method solid image detecting device 22. In order to obtain a color endoscope image, the rotatable filter 23 has a filter 31 for passing through white light , a filter 32 and a filter 33 for transmitting fluorescence in specific bands (λ_1 and λ_2).
In addition, the filter 32 could be a hole.

[0025]
The specific bands can be set at λ_1=480–520nm and λ_2 =630nm and over, for example. This wavelengths λ_1 and λ_2 can be set arbitrary since these wavelengths are set to distinguish between a normal area and a diseased area and can be arbitrary set. However, since the distinction is made by calculating difference described later, it is desirable to choose wavelengths λ_1 and λ_2 by which a certain amount of differences can be obtained.

[0026]
As an example shown in Fig. 3, wavelengths λ_1 and λ_2 are respectively set within the bandwidth of a B filter and a R filter. However, the wavelengths can be set outside the bandwidths. The mosaic filter arranged on the imaging surface of the solid-state image detecting device adapted to the single-plate color method may be arranged in the wavelength region in a manner such that a plurality of filters for different wavelength bands overlap with one another. In the foregoing case, signals can be obtained from pixels of the two filters having the overlapped wavelength bands. Therefore, it is possible to set to increase sensitivity of a weak fluorescence.

[0027]
The image processing circuit 8' [In the original document, described as the observation image apparatus 24] is synchronized with the timing of reading the solid-state image detecting device 22 by the CCU 7 and the timing of processing signals. Thus, it is possible to obtain only fluorescence images in the wavelengths λ_1 and λ_2. In order to distinguish between a normal area and a lesion, In the image processing circuit 8', the signals via the filter 32 for wavelength λ_1 and the filter 33 for wavelength λ_2 are converted to A/D signals and stored respectively in two memories (not illustrated) distributed by a multiplexer (not illustrated) and a difference-calculation is carried out by a calculation circuit (not illustrated). The image processing circuit 8' determines whether the area is normal or diseased based on the difference value obtained by the calculation circuit. In a case of a lesion, the signal of which color is changed, for example, is output to the superimpose circuit 25. A fluorescence image is displayed on the monitor 10 by the superimpose circuit 25 after it is overlapped to the normal image, processed by the CCU.

[0028]
On the other hand, the rotatable filter 23 shown in Fig. 3 (b) is a filter corresponding to the white and black solid-state image detecting device 22. That is, in this example, a color image is performed by combining the filters, R, G, and B which are arranged on the rotatable filter 23. The rotatable filter 23 is provided with filters 32 and 33 which respectively

transmit the wavelengths λ_1 and λ_2 and R, G, and B band filters.

[0029]
In the case where the rotatable filter 23 of Fig. 4 (b) is used, since a black and white solid-state image-detecting device is utilized, the resolution can be improved comparing to the resolution of solid-state image detecting device with a single plate method.

[0030]
In the foregoing structure, first, the rotatable filter 23 in the external camera 6 is rotated at 60Hz by the timing controller 26 in synchronization with the operation of the switching mirror 20 in the adapter 5. White light from the normal light source apparatus 3 is introduced to the light guide of the endoscope to observe a normal endoscope image for the period of 1/4 x 1/60 seconds.
Then, the mirror 20 is switched and laser light (excitation light) from the fluorescence observation light source apparatus 4 is introduced to the light guide 12 of the endoscope for the period of 3/4 x 1/60 seconds.
This excitation light irradiates a living body and fluorescence is generated. The light having the wavelength λ_1 and the light having the wavelength λ_2 of the fluorescence light are transmitted by the filter 32 and the filter 33 respectively and entered to the solid-state image detecting device 22 and then a fluorescence image is acquired. After each video signal corresponding to the normal image and the fluorescence image is processed in the CCU 7, the normal image is displayed on the monitor 10, as it is, and the fluorescence image is further processed by the image processing circuit 8' to be displayed in pseudo color. That is, the normal image and the fluorescence image are overlapped by the superimpose circuit 25 and displayed on the monitor 10.

[0031]
Since the intensity of a fluorescence image is very weak compared to that of a normal image, the opening area of the filter λ_1 and λ_2 are made large.

[0032]
According to the structure of this embodiment, when the switching operation between fluorescence observation and normal observation, an apparatus such as a camera doesn't need to be attached/detached so that both an endoscope image and a fluorescence image can be easily acquired without wasting the time of labor.

[0033]
Moreover, according to the structure of this embodiment, a normal image and a fluorescence image can be processed by one image detecting means so that it has a simple structure comparing to the one with two image detecting means.

[0034]
In addition, a regular fiber-type optical endoscope can be used for the endoscope of this embodiment. A normal light source for emitting white light and a regular laser light source that can acquire a predetermined wavelength can be switched by installing an introduced-light switching adapter so that the switching operation can be made easy.

[0035]
As described above, with the structure of this embodiment, the problem of compatibility of a conventional endoscope is overcome and it is advantageous even in the aspect of cost.

[0036]
Furthermore, in this embodiment, one external camera, which is provided with an image detecting means, a filter means and a drive means, is detachably attached to the eyepiece of a normal endoscope. Thus, a fluorescence image and a normal image can be detected by this external camera in a time divided manner.

[0037]
Next, a second embodiment will be explained. Components of this second embodiment are the same as that of the first embodiment but the operation of those are different. Thus, diagram is omitted and only different operations are explained.

[0038]
When acquiring a normal endoscope image, the rotatable filter 23 arranges the filter 31 shown in Fig. 4 (a) which transmits white light in the optical path of the solid-state image detecting device 22 by the control of the timing controller 26.
At the same time, white light from the normal light source 3 is introduced to the light guide 12 of the endoscope by controlling the switching mirror 20 in the adapter 5.

[0039]
Then, in a case that a fluorescence image is observed, by rotating the rotatable filter 23 and by controlling the switching mirror 20, laser light is introduced to the light guide 13.

[0040]

In this embodiment, an external camera that has a compatibility with an normal endoscope image can be realized.

[0041]
Fig. 5 and Fig. 6 relate to a third embodiment. Fig. 5 shows the overall structure of a fluorescence observation apparatus. Fig. 6 shows the structure of a rotatable filter.

[0042]
In the third embodiment of this invention, in addition to the components of the first embodiment, a fluorescence observation switch (SW) 34 is provided on the external camera 6. A rotatable filter 23A is provided in place of the rotatable filter 23 of the first embodiment. This rotatable filter 23 has a bigger opening than the filters 32, 33 and it is arranged with λ_1 and λ_2 filters each occupies almost half of the whole filter area.
Furthermore, in this example, it is provided with a device (not illustrated) to insert and remove the rotatable filter 23A on the optical path between the solid-state image detecting device 22 and the image guide fiber 11. This inserting/removing device consists of a wavelength selecting means, it consists of a stage for moving the motor 24 connected to the rotatable filter 23 freely and a motor. The inserting/removing means operates according to the instruction from the CCU 7 in response to the switching of the fluorescence observation switch 23.

[0043]
For other structures and operations same as those of the first embodiment, the same reference numerals are given and their descriptions are omitted.

[0044]
While the fluorescence observation switch 34 is on, the fluorescence observation apparatus is in a fluorescence observation state. At the time of fluorescence observation, the rotatable filter 23A shown in Fig. 6 is inserted into the optical path and the reading time of the solid-state image detecting device 22 is extended by the CCU 7.

[0045]
When the switch 34 is turned off, the apparatus becomes in a normal observation state. While observing a normal endoscope image, the signal of the solid-state image detecting device 22 is read every 1/60 seconds. On the other hand, at the time of fluorescence observation, if a fluorescence image has low sensitivity, by setting to read out signals every second, for example, even a weak fluorescence image can be acquired with excellent sensitivity.

[0046]
Moreover, when the switch 34 is turned on, the last normal image is frozen and displayed on the monitor 10. Then, a fluorescence image which is while the switch 34 was on is superimposed on the freeze image and displayed on the monitor 10.

[0047]
According to this embodiment, a fluorescence image and a normal image can be detected selectively. By combining the solid-state image detecting device having excellent sensitivity and an electronic shutter speed being variable, more sensitive image detection on fluorescence images can be realized. The other structures and operations are similar to those obtainable from the first embodiment so that the explanations of those are omitted.

[0048]
Fig. 7 (a) is the overall structure of the fluorescence observation apparatus of a fourth embodiment of this invention. Fig. 7 (b) shows the main components of a fluorescence observation apparatus of a modification example of the fourth embodiment.

[0049]
The structure for switching light sources in an apparatus of this example is different from the one in the first embodiment. That is, in the first embodiment, the light sources were switched in accordance with the drive of the switching mirror 20. However, in this embodiment, the switching of light sources is realized by performing ON/OFF operation of the light sources generating excitation light and normal light respectively and by having one light transmitting means with two branches for both light sources.

[0050]
A fluorescence observation apparatus 50 shown in Fig. 7 (a) contains a CCU 45 which has a combined-function of the CCU 7, the fluorescence image processing apparatus 8 and the control unit 9 of the first embodiment.

[0051]
The fluorescence observation apparatus 50 is provided with an introduced-light switching adapter 46 instead of the introduced-light switching adapter 5 in the first embodiment. The introduced-light switching adapter 46 is located between the fluorescence observation light source 4 and the normal observation light source 3. The introduced-light switching adapter 46 is connected to a fluorescence observation light source (laser light

source in the diagram) 4 via a light guide cable 19A and a normal observation light source (endoscope observation light source in the diagram) 3 via a light guide cable 47.

[0052]
Other structures and effects are the same as those of the first embodiment and the same symbols are utilized and the explanations of those are omitted. Only differences are explained.

[0053]
The introduced-light switching adapter 46 contains a light guide 48 which forks into two branches on the light source side to introduce laser light which is excitation light and normal light respectively to the light guide 12 of the endoscope.

[0054]
The CCU 45 controls the ON/Off operation of the light sources 3 and 4 in synchronization with the control of the motor 45. That is, the CCU 45 also has a function to serve as a control means.

[0055]
At the structure mentioned above, the normal observation light source 3 is turned on during a normal observation and the fluorescence observation light source 4 is turned on during a fluorescence observation. Excitation light and normal light is respectively introduced into the light guide 12 of the endoscope in a time-divided manner from the ends of two branches of the light guide 48 provided in the adapter 46. Then, the same structures for processing each image signal, etc. in the first embodiment can be employed in this embodiment. A switching display may be employed by providing a video switcher instead of the superimpose circuit.

[0056]
The switching operation between normal observation light and fluorescence observation light in this embodiment is performed electrically so that an apparatus can be miniaturized easily and a high-speed switching operation can be realized easily in comparison with the apparatus with a mechanical switching operation.

[0057]
A conventional endoscope and conventional light sources can be used for the apparatus of this embodiment.

[0058]
The other structures and operations and effects are the same as those of the first embodiment and explanations are omitted.

[0059]
In an example of a modification of the fourth embodiment shown in Fig. 7 (b), an adapter 51 containing a dichroic mirror 52 and a mirror 53 is provided instead of the adapter 46. The dichroic mirror 52 of the adapter 51 is angled at 45 degrees on the optical axis connecting the light guide 12 and the light guide cable 42. The mirror 53 is arranged to reflect laser light from the light guide cable 19A to an orthogonal direction of the optical axis toward the dichroic mirror 52. This dichroic mirror 52 reflects laser light, on the other hand, transmits light for normal observation. Thereby, it enables to introduce each light to the one light guide 12 of the endoscope.

[0060]
The other structures and operations and effects are similar to those of the fourth embodiment. Thus, their descriptions are omitted.

[0061]
Fig. 8 is the overall structure of the fluorescence observation apparatus of a fifth embodiment of this invention.

[0062]
The difference between this embodiment and the fourth embodiment, except for the introduced-light switching adapter 46, is that a light guide is branched off on the endoscope side. This apparatus of this embodiment has a light source 44, which contains a laser light source 43 and a lamp 17, instead of the light sources 3 and 4.

[0063]
An endoscope 42 shown in Fig. 8 is provided with a light guide 41 in which a light transmitting means and an introduced-light selecting means are united. This light guide 41 is forked into two ends in the connector of the universal cord 15. Each end of the light guide 41 is connected to the light source apparatus 44 so that each light emitted from the lamp 17 and the laser source 43 is introduced and irradiated respectively by one emission end placed on the distal portion of the endoscope.

[0064]
The lamp 17 and the laser source 43 can be turned off and on by the CCU 45. Image processing, etc. are the same as that of the fourth embodiment.

[0065]

This embodiment is different from the fourth embodiment and no adapter is required.

[0066]
[Effect of the Invention]
According to a fluorescence observation apparatus of this invention, it is unnecessary to install or remove devices such as a camera so that the labor is saved and both images of an endoscope image and a fluorescence image can easily be acquired.

[Brief Explanation of Drawings]
[Fig. 1]
Fig. 1 through Fig. 4 relate to a first embodiment and Fig. 1 is an overall structural diagram of a fluorescence observation apparatus.

[Fig. 2]
Fig. 2 is a characteristic diagram showing the difference of fluorescence characteristic in a normal area and a diseased area.

[Fig. 3]
Fig. 3 is an explanatory drawing showing the relationship between the transmitting characteristic and the wavelengths λ_1 and λ_2.

[Fig. 4]
Fig. 4 is a structural diagram of a rotatable filter.

[Fig. 5]
Fig. 5 and Fig. 6 relate to a third embodiment, Fig. 5 is an overall structural diagram of a fluorescence observation apparatus.

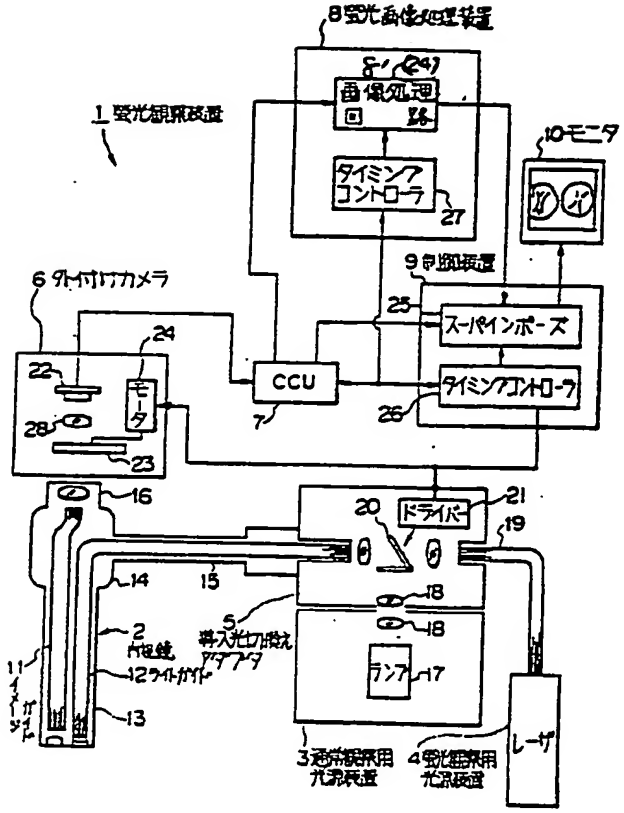
[Fig. 6]
Fig. 6 is a structural diagram of a rotatable filter.

[Fig. 7]
Fig. 7 (a) is an overall structural diagram of a fluorescence observation apparatus of a fourth embodiment, Fig. 7 (b) is a structural diagram showing the principal components of a modified fluorescence observation apparatus of the fourth embodiment.

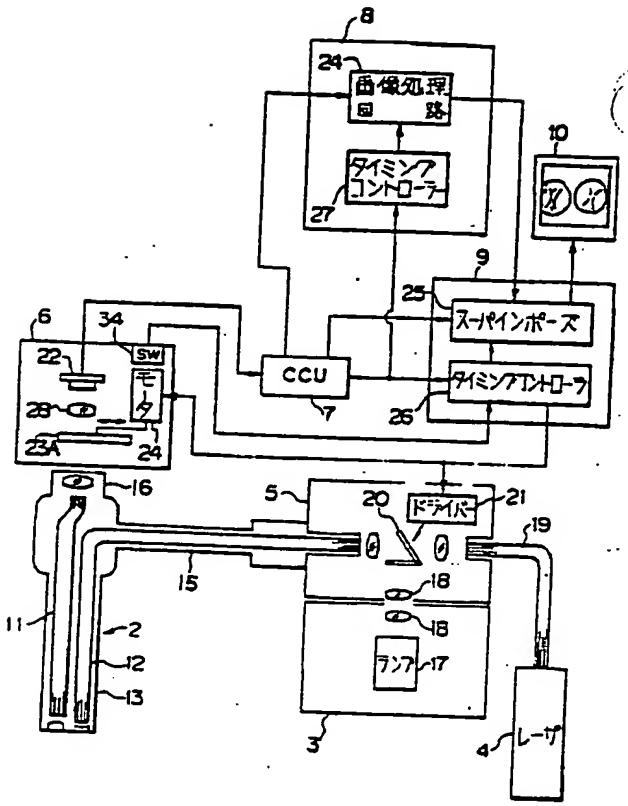
[Fig. 8]
Fig. 8 is an overall structural diagram of a fluorescence observation apparatus of a fifth embodiment.

[Explanation of Symbols]
1...a fluorescence observation apparatus
2...an endoscope
11...an image guide
12...a light guide
3...a normal observation light source apparatus
4...a fluorescence observation light source apparatus
5...an introduced-light switching adapter
20...a switching mirror
21...a driver
6...an external camera
22...a solid-state image detecting element
23...a rotatable filter
24...a motor
7...a CCU
8...a fluorescence image processor
8'... an image processing circuit
26, 27...a timing controller
10...a monitor

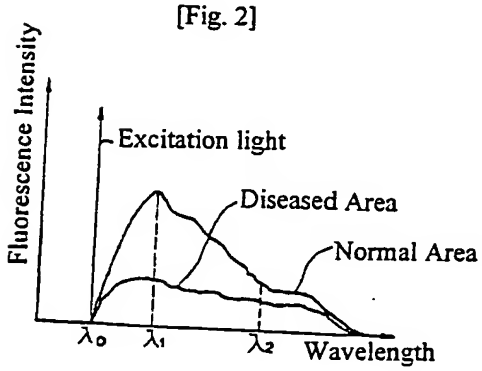
[Fig. 1]



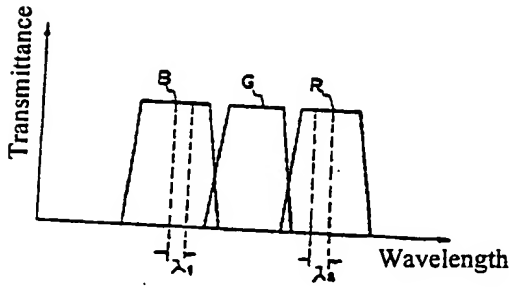
[Fig. 5]



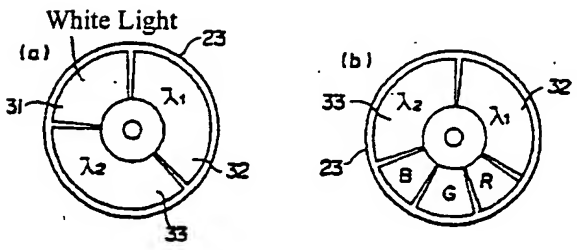
[Fig. 2]



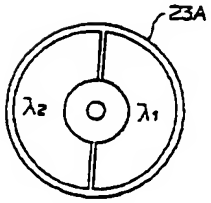
[Fig. 3]



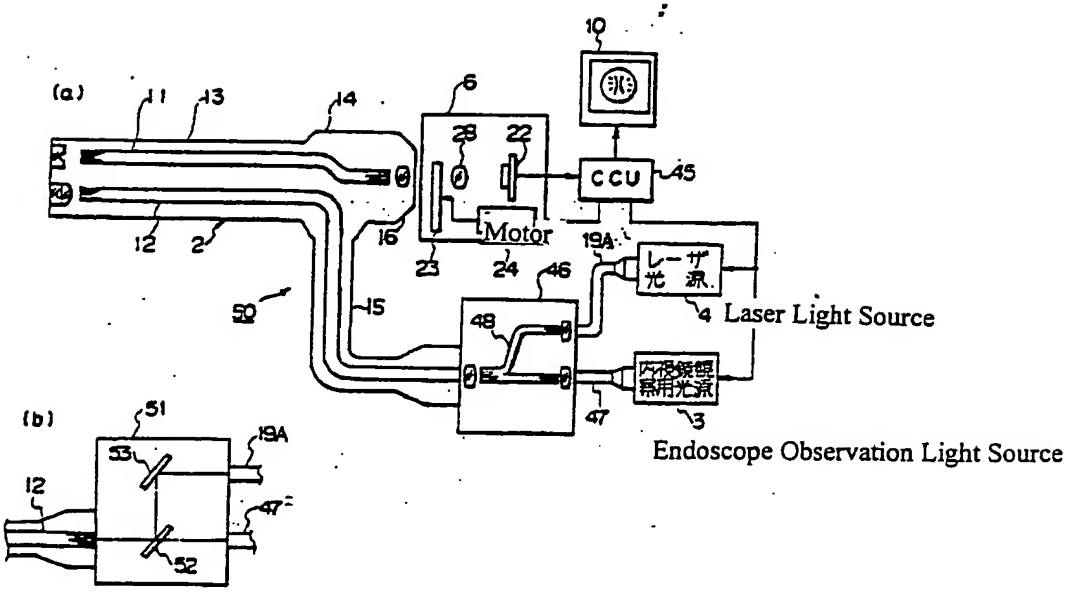
[Fig. 4]



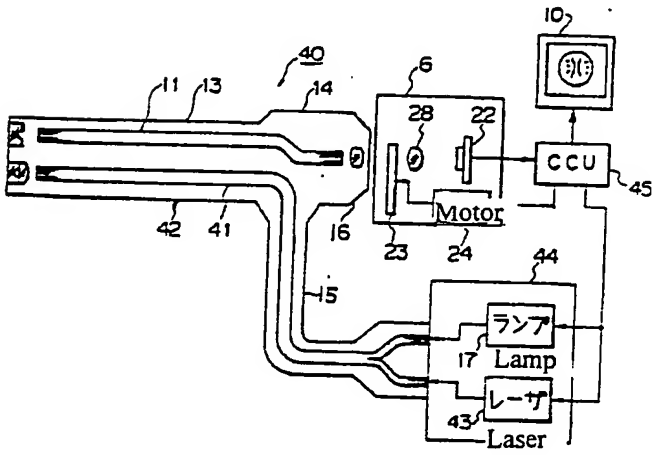
[Fig. 6]



[Fig. 7]


(a)
(b)
CCU
Motor
Laser Light Source
Endoscope Observation Light Source

[Fig. 8]


CCU
Motor
Lamp
Laser

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(57)【要約】

(57)[SUMMARY]

【目的】
カメラ等の装置の着脱を不要としてその手間を省き、内視鏡画像と蛍光画像との両方を得ることができる蛍光観察装置を提供すること。

【構成】
導入光切換えアダプタ５により選択された通常観察光または励起光が、内視鏡２のライトガイド１２から被写体に当たり、通常観察光の像と励起光による蛍光像がイメージガイド１１により外付けカメラ６に導光される。前記光源の切換えと同期して回転フィルタ２３が回転しており、この回転フィルタ２３に設けられたフィルタ３１，３２

[OBJECT]
Provide the fluorescent observation apparatus which can obtain both endoscope image and fluorescent images. Time is saved since the insertion or removal of apparatuses, such as a camera, is unnecessary.

[SUMMARY OF THE INVENTION]
For the usual or excitation light chosen by the introduced light change adapter 5, via the light guide 12 of an endoscope 2 it reaches the photographed object, and the light-guide of the image of a usual observation light and the fluorescent image by excitation light is transmitted to the external attachment camera 6 by image guide 11.

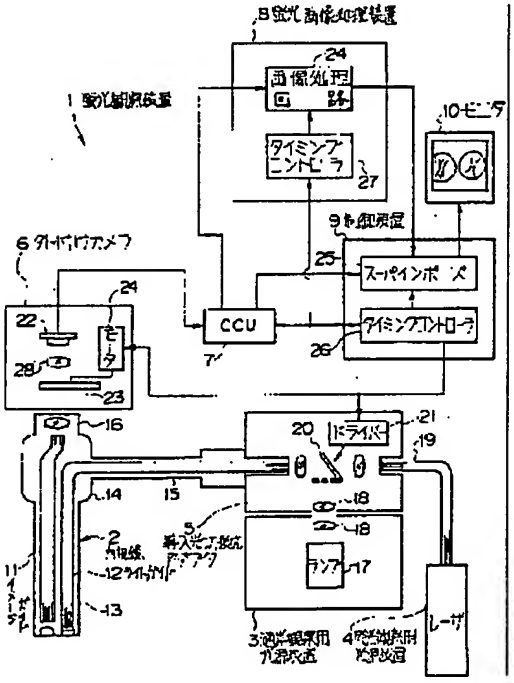
The rotating filter 23 is rotating synchronizing with a change of the above-mentioned light source.

により、通常観察光と、λ１，λ２の波長帯域の蛍光とが時分割に透過されて、一つの固体撮像素子２２に入射する。この固体撮像素子２２が通常観察光による観察像及び励起光による蛍光像を時分割で撮像する。

The usual observation light and the fluorescence of (lambda)1, (lambda)2 wavelength band were passed through by the time division with filters 31 and 32 provided on this rotating filter 23.

It incidents one solid-state image sensor 22.

This solid-state image sensor 22 records the observation image by the usual observation light, and the fluorescent image by excitation light by the time division.



[translation of Japanese text in Selection Diagram]

also refer to EXPLANATION OF DRAWINGS

24 (in 8) image processor

27 timing controller

【特許請求の範囲】 **[CLAIMS]**

【請求項１】
通常の照明光による観察像と励起光による蛍光像とを時分割または選択的に撮像可能とする蛍光観察装置であって、
被写体に照射するための光を伝達する光伝達手段及びこの光伝達手段からの光が被写体に反射して得た像を伝達する像伝達手段とを内蔵している内視鏡と、
通常内視鏡観察を行うための通常照明光を発する通常観察光発生手段と、
蛍光観察を行うための励起光を発する蛍光観察光発生手段と、
前記通常観察光発生手段からの通常照明光及び前記蛍光観察光発生手段からの励起光を選択的に前記光伝達手段に供給する導入光切換え手段と、
前記像伝達手段により伝達された前記通常照明光の波長帯域の少なくとも一部の波長帯域からなる光、及び前記像伝達手段により伝達された前記励起光が被写体に当たって発生した蛍光が有する波長帯域の少なくとも一部の波長帯域からなる光を選択的に通過または透過させる波長選択手段と、
前記導入光切換え手段における前記通常観察光と前記励起光との切換えの制御と共に、この切換えに同期して前記波長選択手段において前記像伝達手段により伝達された光を選択的に通過

[CLAIM 1]
A fluorescent observation apparatus.
For the observation image by the usual illumination light, and the fluorescent image by excitation light, the fluorescent observation apparatus which can image pick-up these in time slices or selectively.
Comprising, optical transfer means to transfer the light for irradiating for a photographed object, and, the endoscope which has built-in image transfer means to transfer the image which the light from this optical transfer means reflected and obtained for the photographed object, usual observation light generating means which emits the usual illumination light for performing usual endoscope observation, fluorescent observation light generating means which emits the excitation light for performing fluorescent observation, introduced light change means to supply selectively the usual illumination light from above-mentioned usual observation light generating means, and the excitation light from above-mentioned fluorescent observation light generating means to above-mentioned optical transfer means, light of at least part of the wavelength band of the above-mentioned usual illumination light transferred by the above-mentioned image transfer means.
And wavelength-selection means to make the light of the wavelength band which the fluorescence which the above-mentioned excitation light transferred by the above-mentioned image transfer means generated in the photographed object from a partial wavelength band at least pass or permeate

または透過させるための制御をする制御手段と、
前記波長選択手段により選択的に通過または透過された波長帯域の光を受けて像を撮像する一つの撮像手段と、
を有していることを特徴とする蛍光観察装置。

selectively, in the above-mentioned introduced light change means, together with controlling the switching of the above-mentioned usual observation light and above-mentioned usual above-mentioned excitation light, synchronous with this change, control means to control making the light transferred by the above-mentioned image transfer means in above-mentioned wavelength-selection means pass or permeate selectively, the light of the wavelength band selectively passed through or passed through by the above-mentioned wavelength-selection means is received, and one image-pick-up means to image-pick up an image, it has these components.

【発明の詳細な説明】

[DETAILED DESCRIPTION OF INVENTION]

【０００１】

[0001]

【産業状の利用分野】
本発明は、疾患部位の診断に役立てるため、通常光による観察像と、被検査対象に励起光を照射しその被検査対象から発する蛍光よる観察像とが撮像できる蛍光観察装置に関する。

[Industry-form application]
In order to use this invention for the diagnosis of an illness site, it is related with the fluorescent observation apparatus which can image-pick up the observation image by the ordinary light, and the fluorescent observation image whereby excitation light is irradiated to an examination object and emitted from the examination object.

【０００２】

[0002]

【従来の技術】
近年、生体からの自家蛍光や、

[PRIOR ART]
In recent years, from The self-fluorescence

生体へ薬物を注入し、その薬物の蛍光を２次元画像として検出し、その蛍光像から、生体組織の変性や癌等の疾患状態（例えば、疾患の種類や浸潤範囲）を診断する技術がある。

from the organism, or medicine is injected into the organism, it is detected, using the fluorescence of the medicine as a two-dimensional image.

From the fluorescent image, there is a technique whereby illness states (for example, the kind and permeation extent of the illness), such as the modification of an organism tissue and cancer, are diagnosed.

【０００３】

生体組織に光を照射するとその励起光より長い波長の蛍光が発生する。生体における蛍光物質として、例えばＮＡＤＨ（ニコチンアミドアデニンヌクレオチド），ＦＭＮ（フラビンモノヌクレオチド），ピリジンヌクレオチド等がある。最近では、このような、生体内因物質と、疾患との相互関係が明確になってきた。また、ＨｐＤ（ヘマトポルフィリン），Ｐｈｏｔｏｆｒｉｎ，ＡＬＡ（δ－ａｍｉｎｏｌｅｖｕｌｉｎｉｃ ａｃｉｄ）は、癌への集積性があり、これを生体内に注入し、前記物質の蛍光を観察することで疾患部位を診断できる。

[0003]

If a light is irradiated to an organism tissue, the fluorescence of a wavelength longer than the excitation light will occur.

It uses as the fluorescent material in the organism, for example, there are NADH (nicotinamide adenine nucleotide), FMN (flavin mononucleotide), pyridine nucleotide, etc.

Recently, the interactive relationship with the illness and such in-the-living-body ?factor-substance? becomes clear.

Moreover, HpD (hematoporphyrin) and Photofrin, ALA((delta)-amino levulinic acid) have the accumulation property towards cancer.

This is injected in the living body, an illness site can be diagnosed by observing the fluorescence of the above-mentioned matter.

【０００４】

ところで、前記の蛍光は、極めて微弱であるので、その観察のためには、極めて高感度の撮影を必要とする。この高感度撮影を行うものとしてイメージ・イ

[0004]

By the way, since the above-mentioned fluorescence is very slight, it needs photography of a high sensitivity extremely for the observation.

The image intensifier is well known as that

ンテンシファイヤが良く知られている。また、最近では２次元で同期検波を行い、感度を高める方法が提案されている。

which performs this high-sensitivity photography.
Moreover, recently, two-dimensional synchronous detection is performed, and the process of increasing the sensitivity is proposed.

【０００５】
一方、蛍光観察においては、蛍光像の他、通常の画面の観察も、オリエンテーションや病変部の位置を認識する等の点から重要である。また、従来例では、蛍光像と通常像の両方を撮影するため、複数のカメラを使用して撮影していた。

[0005]
On the one hand, concerning fluorescent observation, besides fluorescent images, the observation of a usual screen is also important from the end of recognizing the orientation and the position of a disease part.
Moreover, in the prior art examples, in order to take a photograph of both fluorescent image and usual image, a photograph was taken using some cameras.

【０００６】

[0006]

【発明が解決しようとする課題】
前記蛍光観察を内視鏡装置に応用した場合、すなわち内視鏡を用いて蛍光観察を行う装置では、通常の内視鏡像を得る手段と、蛍光像を得る高感度の撮像デバイスが必要である。そして、通常の観察画像と蛍光画像とを切換える際には、カメラ等の装置の着脱を要して手間がかかり、装置が大がかりになるという欠点があった。

[PROBLEM ADDRESSED]
When applying the above-mentioned fluorescent observation to an endoscope apparatus, the image-pick-up device of means to obtain a usual endoscope image in the apparatus which performs fluorescent observation using an endoscope, and the high sensitivity which obtains a fluorescent image is required.
And, in case a usual observation image and a usual fluorescent image are switched, the insertion or removal of apparatuses, such as the camera, is required and it takes time, and there was a fault that the apparatus became large-scale.

【０００７】
本発明は前記事情に鑑みてなされたもので、カメラ等の装置の着脱を不要としてその手間を省き、内視鏡画像と蛍光画像との両方を得ることができる蛍光観察装置を提供することを目的としている。

[0007]
This invention was made in view of the above-mentioned situation, making the insertion or removal of apparatuses, such as a camera, unnecessary, and time is saved.

It aims at providing the fluorescent observation apparatus which can obtain both endoscope image and a fluorescent image.

【０００８】

[0008]

【課題を解決するための手段】
本発明は、通常の照明光による観察像と励起光による蛍光像とを時分割または選択的に撮像可能とする蛍光観察装置であって、被写体に照射するための光を伝達する光伝達手段及びこの光伝達手段からの光が被写体に反射して得た像を伝達する像伝達手段とを内蔵している内視鏡と、通常内視鏡観察を行うための通常照明光を発する通常観察光発生手段と、蛍光観察を行うための励起光を発する蛍光観察光発生手段と、前記通常観察光発生手段からの通常照明光及び前記蛍光観察光発生手段からの励起光を選択的に前記光伝達手段に供給する導入光切換え手段とを有している。

[SOLUTION OF THE INVENTION]
This invention is the observation image by the usual illumination light, and the fluorescent image by excitation light or fluorescent observation apparatus whose image pick-up is enabled selectively or in time slices.
Comprising, optical transfer means to transfer the light for irradiating for a photographed object and, the endoscope which has built-in image transfer means to transfer the image which the light from this optical transfer means reflected and obtained for the photographed object, usual observation light generating means which emits the usual illumination light for performing a usual endoscope observation, fluorescent observation light generating means which emits the excitation light for performing fluorescent observation, introduced light change means to supply selectively the usual illumination light from above-mentioned usual observation light generating means, and the excitation light from above-mentioned fluorescent observation light generating means

to above-mentioned optical transfer means.

It has these components.

【０００９】

さらに本発明の蛍光観察装置は、前記像伝達手段により伝達された前記通常照明光の波長帯域の少なくとも一部の波長帯域からなる光、及び前記像伝達手段により伝達された前記励起光が被写体に当たって発生した蛍光が有する波長帯域の少なくとも一部の波長帯域からなる光を選択的に通過または透過させる波長選択手段と、前記導入光切換え手段における前記通常観察光と前記励起光との切換えの制御と共に、この切換えに同期して前記波長選択手段における前記波長選択手段において前記像伝達手段により伝達された光を選択的に通過または透過させるための制御をする制御手段と、前記波長選択手段により選択的に通過または透過された波長帯域の光を受けて像を撮像する一つの撮像手段とを有している。

[0009]

Furthermore, concerning the fluorescent observation apparatus of this invention, the light of the wavelength band of the above-mentioned usual illumination light transferred by the above-mentioned image transfer means from at least a partial wavelength band, and the above-mentioned excitation light transferred by the above-mentioned image transfer means shine upon the photographed object, and wavelength-selection means to make the light of the wavelength band which the generated fluorescence has from the partial wavelength band at least pass or permeate selectively, while controlling the change of the usual above-mentioned observation light in above-mentioned introduced light change means, and above-mentioned excitation light, control means to control making the light transferred by the above-mentioned image transfer means in above-mentioned wavelength-selection means in above-mentioned wavelength-selection means synchronizing with this change pass or permeate selectively, one image-pick-up means whereby an image is recorded in response to the fact that the light of the wavelength band selectively passed through or passed through by the above-mentioned wavelength-selection means

It has these components.

【００１０】

[0010]

【作　用】
本発明の構成によれば、制御手段の制御の基で導入光切換え手段により選択された通常観察光または励起光が、内視鏡の光伝達手段により伝達され、被写体に照射される。前記通常観察光が前記被写体に当たった反射光または前記励起光が被写体に当たって発生した蛍光が像伝達手段により伝達される。

【００１１】
さらに本発明の構成で、前記制御手段の制御の基で波長選択手段により、前記通常観察光と前記励起光との切換え制御に同期して、前記像伝達手段により伝達された前記通常観察光及び蛍光が選択的に通過または透過されて、前記通常照明光の少なくとも一部の波長帯域を有する光または前記蛍光の少なくとも一部の波長帯域を有する光となって一つの撮像手段に入射する。前記撮像手段がこの入射光を受けて通常観察光による観察像及び励起光による蛍光像を撮像する。

[Effect]
According to the composition of this invention, the usual observation light or the usual excitation light chosen by introduced light change means by the basis of the control by the control means is transferred by optical transfer means of the endoscope.

It is irradiated onto the photographed object.

The fluorescence which the reflected light to which the above-mentioned usual observation light shone upon the above-mentioned photographed object, or above-mentioned excitation light generated in the photographed object is transferred by image transfer means.

[0011]
Furthermore with the composition of this invention, based on the control of above-mentioned control means, and wavelength-selection means, it synchronizes with the change control of the above-mentioned usual observation light and above-mentioned usual above-mentioned excitation light.

The above-mentioned usual observation light and the above-mentioned usual fluorescence which were transferred by the above-mentioned image transfer means were passed or passed through selectively.

It becomes the light which has the light of the above-mentioned usual illumination light which has a partial wavelength band at least, or the wavelength band of above-mentioned fluorescent at least one part, and incidents to one image-pick-up means.

Above-mentioned image-pick-up means

records the observation image according to a usual observation light in response to this incident light, and the fluorescent image by excitation light.

【００１２】

[0012]

【実施例】

[Embodiment]

図を参照して本発明の実施例について、以下に説明する。図１ないし図は本発明の第１実施例に係り、図１は蛍光観察装置の全体的な構成図、図２は励起光を照射した際の正常部位と病変部位との蛍光特性の違いを示す特性図、図３はＲＧＢフィルタの透過特性と波長λ１，λ２の関係を示す説明図、図４は回転フィルタの構成図である。

With reference to diagrams, the embodiment of this invention is demonstrated below.

Diagram 1 or diagram ?? concerns the 1st embodiment of this invention.

Diagram 1 is an entire block diagram of fluorescent observation apparatus.

Diagram 2 is a characteristic view showing the difference of the fluorescent characteristic of the normal site and diseased site at the time of irradiating excitation light.

Diagram 3 is the permeation characteristic of RGB filter, and an explanatory drawing showing the wavelength (lambda)1, (lambda)2 relationship.

Diagram 4 is a block diagram of a rotating filter.

【００１３】

[0013]

図１に示す蛍光観察装置１は、ファイバー式光学内視鏡２と、この内視鏡２に通常内視鏡観察光を発する通常観察用光源装置３と、蛍光観察を行うための励起光となる例えばＨｅ－Ｃｄレーザ光を発する蛍光観察用光源装置４と、前記通常観察用光源装置３及び蛍光観察用光源装置

For The fluorescent observation apparatus 1 shown in Diagram 1, the fibre type optical endoscope 2 and the usual light source device for observation 3 which emits a usual endoscope observation light to this endoscope 2, the fluorescent light source device for observation 4 used as the excitation light for performing fluorescent observation which emits a He-Cd laser light, for example, the introduced

４からの光を選択的に内視鏡２に供給する導入光切換えアダプタ５と、前記内視鏡２の後述する接眼部に連結される外付けカメラ６とを有している。尚、前記蛍光観察用光源装置４は、色素レーザ，クリプトンレーザ，エキシマレーザ等でも良く、特に検定されない。また、励起光の波長は、例えば３５０ｎｍ～５００ｎｍの光が発生されるが、蛍光を生じる励起光としての役目ができるのであれば、これに限定されるものではない。

light change adapter 5 which supplies selectively the light from the above-mentioned usual light source device for observation 3, and the fluorescent light source device for observation 4 to an endoscope 2, the external attachment camera 6 connected with the eye-piece part which the above-mentioned endoscope 2 mentions later.

It has these components.

In addition, a dye laser, a krypton laser, an excimer laser, etc. are sufficient as the above-mentioned fluorescent light source device for observation 4.

It is not especially examined.

Moreover, as for the wavelength of excitation light, 350 nm - 500 nm light is generated, for example.

However, as long as it is excitation light which can produce fluorescence, it will not be limited to this.

【００１４】

また、前記蛍光観察装置１は、前記外付けカメラ６が撮像した内視鏡からの像を処理するＣＣＵ（カメラコントロールユニット）７と、前記ＣＣＵ７で得られた画像に演算処理を施し、蛍光観察画像を得る蛍光画像処理装置８とを有している。さらに、前記蛍光観察装置１は、前記導入光切換えアダプタ５及び外付けカメラ６を制御すると共に、前記ＣＣＵ７及び蛍光画像処理装置８の各画像出力を重畳可能に構成された制御装置９と、前

[0014]

Moreover, the above-mentioned fluorescent observation apparatus 1 arithmetic-processes in the image obtained by CCU (camera control unit)7 which processes the image from an endoscope which the above-mentioned external attachment camera 6 recorded, and above-mentioned CCU7.

It has the fluorescent image processing device 8 which obtains fluorescent observation image.

Furthermore, while the above-mentioned fluorescent observation apparatus 1 controls the above-mentioned introduced light change adapter 5 and the external attachment camera

記制御装置９からの画像出力を表示するモニタ１０とを有している。

6, the control apparatus 9 which can superimpose in above-mentioned CCU7 and each above-mentioned image output of the fluorescent image processing device 8, It has monitor 10 which displays the image output from the above-mentioned control apparatus 9.

【００１５】
前記内視鏡２は、像伝達手段を構成するイメージガイドファイバ１１及び光伝達手段を構成するライトガイド１２を挿通する挿入部１３と、操作部１４の側部から延出し、且つライトガイド１２を挿通するユニバーサルコード１５とを有している。ユニバーサルコード１５は、前記導入光切換えアダプタ５に接続され、前記ライトガイド１２が照明光を挿入部１３先端へ伝達するようになっている。前記内視鏡２の接眼部１６に配置されたイメージガイドファイバ１１の出射端から、内視鏡像が前記外付けカメラ６に伝達される。

[0015]
The above-mentioned endoscope 2 is extended from the insertion part 13 which passes through the light guide 12 which constitutes image guide fibre 11 and optical transfer means of constituting image transfer means, and the side part of an operating part 14.

And it has the universal cord 15 which passes through a light guide 12.

The universal cord 15 is connected to the above-mentioned introduced light change adapter 5.

The above-mentioned light guide 12 transfers the illumination light to insertion-part 13 end.

From the radiation end of image guide fibre 11 situated on the eye-piece part 16 of the above-mentioned endoscope 2, an endoscope image is transferred to the above-mentioned external attachment camera 6.

【００１６】
前記通常観察用光源装置３は、通常観察光発生手段としての例えばキセノンのランプ１７が配置され、このランプ１７が発する通常観察光が光学系１８を介して、前記導入光切換えアダプタ５に供給されるようになっている。蛍光観察用光源装置４は、

[0016]
As for the above-mentioned usual light source device for observation 3, lamp 17 as usual observation light generating means (for example, xenon) is attached.

The usual observation light which this lamp 17 emits supplies the above-mentioned introduced light change adapter 5 via an optical system 18.

蛍光観察光発生手段としての図示しない例えば半導体等の固体レーザ源を有している。尚、蛍光観察光発生手段は、前記固体レーザ源に限定されるものではなく、例えばガスレーザでも良い。

The fluorescent light source device for observation 4, not displayed, as fluorescent observation light generating means, for example, has a source such as a semiconductor solid state laser.

In addition, fluorescent observation light generating means is not limited to the above-mentioned source of a solid state laser, and a gas laser is sufficient also.

【００１７】

前記導入光切換えアダプタ５は、前記通常観察用光源装置３が発する通常観察光と、前記蛍光観察用光源装置４が発してライトガイド１９により伝達されたレーザ光との交点に、切換えミラー２０を配置している。すなわち、前記通常観察光と前記レーザ光とは、直交して入射し切換えミラー２０の位置で交わるように配置されている。前記切換えミラー２０は、ドライバ２１により回転駆動され、内視鏡側の前記ライトガイド１２と、レーザ側の前記ライトガイド１９を結ぶ光路上から挿脱されるようになっている。このような構成により、ランプ１７の通常観察光と、蛍光観察用光源４からのレーザ光とを切り換えて、内視鏡側ライトガイド１２に供給するようになっている。

[0017]

The above-mentioned introduced light change adapter 5 configures the change mirror 20 at the intersection of the usual observation light which the above-mentioned usual light source device for observation 3 emits, and the laser light which the above-mentioned fluorescent light source device for observation 4 emits, and was transferred by the light guide 19.

That is, the above-mentioned usual observation light and the above-mentioned laser light is configured so that they cross diagonally, and incidence may be carried out and it may cross at the position of the change mirror 20.

Rotation actuation of the above-mentioned change mirror 20 is carried out by driver 21.

The above-mentioned light guide 12 by the side of an endoscope and the above-mentioned light guide 19 by the side of a laser are install/removed from the bind optical path.

By such composition, the usual observation light of lamp 17 and the laser light from the fluorescent light source for observation 4 are switched.

The endoscope side light guide 12 is

supplied.

【００１８】
前記外付けカメラ１６は、前記イメージガイドファイバ１１により伝達された像を光学系２８を介して撮像する高感度の例えばＣＭＤ(charge modulation dev-ice)からなる撮像手段としての固体撮像素子２２と、この固体撮像素子２２と前記イメージガイドファイバ１１との光路上に介装された異なる帯域幅を有する複数のフィルタが配置された波長選択手段を構成する回転フィルタ２３と、この回転フィルタ２２を回転させる波長選択手段を構成するモータ２３とを有している。前記固体撮像素子２２は、前記ＣＣＵ７により読み出しのタイミングが制御されている。この読み出しは、後述のタイミングコントローラ２６にて制御することもできる。尚、前記固体撮像素子２２は、ＣＣＤ（電化結合素子）、ＳＩＴ（static incduced transistor），ＭＯＳ型の各撮像デバイスでもよい。

[0018]
For the external attachment camera 16, the solid-state image sensor 22 as image-pick-up means as the high sensitivity which records the image transferred with above-mentioned image guide fibre 11 via an optical system 28, for example, consists of a CMD(charge modulation device), the rotating filter 23 which constitutes wavelength-selection means that some filters which have the different bandwidth of this solid-state image sensor 22 and above-mentioned image guide fibre 11 situated in the optical path have been configured, it has motor 23 which constitutes wavelength-selection means which rotates this rotating filter 22.

As for the above-mentioned solid-state image sensor 22, timing of the reading is controlled by the above-mentioned CCU7.

This reading is also controllable by the below-mentioned timing controller 26.

In addition, either a CCD (electrification [sic] coupled device) SIT(static induced transistor), or MOS type image-pick-up device is sufficient as the above-mentioned solid-state image sensor 22.

【００１９】
前記固体撮像素子２２が光電変換した出力は、前記ＣＣＵ７に供給され、このＣＣＵ７は通常の画像処理を行うようになっている。前記ＣＣＵ７の出力は、

[0019]
The output in which the above-mentioned solid-state image sensor 22 carried out the photoelectric conversion is supplied to above-mentioned CCU7, and this CCU7 performs the usual image processing.

前記蛍光画像処理装置８内の画像処理回路２４に供給され、この画像処理回路２４は、ＣＣＵ７で得られた画像に対して演算処理を施して、蛍光観察画像を得るようになっている。

The above-mentioned output of CCU7 is supplied to the image-processing circuit 24 in the above-mentioned fluorescent image processing device 8.
This image-processing circuit 24 arithmetic-processes to the image obtained by CCU7, and a fluorescent observation image is obtained.

【００２０】
前記ＣＣＵ７の画像出力と、前記画像処理回路２４の蛍光観察画像とは、前記制御装置９のスーパーインポーズ回路２５により重畳され、前記モニタ１０に出力されるようになっている。

[0020]
The above-mentioned image output of CCU7 and the fluorescent observation image of the above-mentioned image-processing circuit 24 are superimposed by the superimposition circuit 25 of the above-mentioned control apparatus 9, and it outputs to the above-mentioned monitor 10.

【００２１】
一方、前記制御装置９は、制御手段としてのタイミングコントローラ２６を有している。前記タイミングコントローラ２６は、前記導入光切換えアダプタ５のドライバ２１と前記外付けカメラ６のモータ２４を制御している。すなわち、このタイミングコントローラ２６は、前記切換えミラー２０の切換えによる照明光の切換えのタイミングと、前記回転フィルタ２３における複数の帯域幅フィルタの切換えのタイミングとを制御している。そしてモータ２４は、タイミングコントローラ２６により、アダプタ５内の切換えミラー２０と同期して制御されて、

[0021]
On the one hand, the above-mentioned control apparatus 9 has the timing controller 26 as control means.

The above-mentioned timing controller 26 is controlling driver 21 of the above-mentioned introduced light change adapter 5, and motor 24 of the above-mentioned external attachment camera 6.

That is, this timing controller 26 is controlling timing of the change of the illumination light by change of the above-mentioned change mirror 20, and timing of the change of some bandwidth filters in the above-mentioned rotating filter 23.

And motor 24 was controlled by the timing controller 26 synchronizing with the change mirror 20 in an adapter 5.

The rotating filter 23 actuates.

回転フィルタ２３が駆動される。

【００２２】
前記ＣＣＵ７の画像処理のタイミングと、前記タイミングコントローラ２６により制御されたスーパーインポーズ回路２５の処理タイミングと、前記蛍光画像処理装置８のタイミングコントローラ２７により制御される前記画像処理回路２４の処理タイミングとは、同期が取られるようになっている。

[0022]
The timing of the image processing of above-mentioned CCU7, the process timing of the superimposition circuit 25 controlled by the above-mentioned timing controller 26, and the process timing of the above-mentioned image-processing circuit 24 controlled by the timing controller 27 of the above-mentioned fluorescent image processing device 8 are synchronized.

【００２３】
ここで、図２は励起光λ０を照射した時の蛍光特性を示す。例えば４４２ｍｍの励起光で得られる組織の蛍光は、正常部位ではその強度が強く、病変部では、波長の短い側で正常に比べ弱い。つまり、図中λ１，λ２と正常と病変で蛍光強度の比率が異なるので、このλ１，λ２の比率を求めることで病変と正常を区別することができる。尚、サンプリングする波長は、λ１，λ２に限らず、三つ以上あっても良い。

[0023]
Here, Diagram 2 shows the fluorescent characteristic when irradiating excitation-light (lambda)0.

For example, by the normal site, the strength of the fluorescence of the tissue obtained by 442 mm excitation light is strong.

Compared with the normal case, it is weak at the region of a diseased part for short wavelengths.

In other words, for (lambda)1, (lambda)2 and the normal case, since the ratio of the fluorescence intensity differs by the disease, disease and benign are distinguishable by measuring this (lambda)1, (lambda)2 ratio.

In addition, the wavelength which carries out a sampling may not be restricted to (lambda)1, (lambda)2, and there may be more than three.

【００２４】
図４には、前記回転フィルタ２

[0024]
The example of composition of the above-

３の構成例を示す。図４（ａ）は単板カラー方式の固体撮像素子２２を用いた場合の回転フィルタ２３であり、カラー内視鏡像を得るために白色光を通過させるフィルタ３１と、特定の帯域（λ１，λ２）の蛍光を通すフィルタ３２，３３よりなる。尚、前記フィルタ３１は、ただ単に孔が開いているだけでも良い。

mentioned rotating filter 23 is shown in Diagram 4.

Diagram 4 (a) is the rotating filter 23 at the time of using the solid-state image sensor 22 of a single-plate colour system.

In order to obtain a colour endoscope image, it consists of filter 31 which passes white light, and filters 32 and 33 which pass through the band ((lambda)1, (lambda)2) specific fluorescence.

In addition, as for the above-mentioned filter 31, it is suitable to be simply a hole opening.

【００２５】
また、前記特定の帯域は、例えば、λ１＝４８０～５２０ｎｍ，λ２＝６３０ｎｍ～とすることができる。この波長λ１，λ２は、正常部位と病変部位とを識別するために設定したものなので、任意に設定できる。しかし、以下のように差分を取って識別しているので、ある程度の差分量が得られる波長λ１，λ２を選ぶことが望ましい。

[0025]
Moreover, the above-mentioned specific band can be made into (lambda)1 =480 - 520 nm, (lambda)2 =630 nm -, for example.

This wavelength (lambda)1, (lambda)2, since it is set to to distinguish between a normal site and the disease site, it can be set up arbitrarily.

However since it is identified by taking the difference as follows, it is desirable to choose (lambda)1, (lambda) 2 wavelength so that a certain amount of difference quantity is obtained.

【００２６】
尚、図３に示す例では、波長λ１，λ２は、それぞれＢフィルタとＲフィルタの帯域幅に納まって設定されているが、この以外の設定外でも良い。単板カラー方式の固体撮像素子は、モザイクフィルタが撮像面に配置されているので、複数の異なる帯域幅のフィルタが重複する波長

[0026]
In addition, in the example shown in Diagram 3, wavelength (lambda)1, (lambda) 2 is respectively set as the bandwidth of B filter and R filter.

However, it may be outside the setup of those other than this. ???

Since, as for the solid-state image sensor of a single-plate colour system, the mosaic filter is configured on the image-pick-up surface, it may

域に設定しても良い。この場合には、モザイクフィルタのうち重複する波長域に感度を持つ二つのフィルタの画素から信号が得られるので、微弱な蛍光像の感度を上げるように設定することもできる。

be set as the wavelength range which the filter of a bandwidth with which some differ overlaps.

In this case, since a signal is obtained from the pixel of the two filter which has a sensitivity in the wavelength range which overlaps among mosaic filters, it can also be set up so that the sensitivity of a slight fluorescent image may be increased.

【００２７】

前記観察画像装置２４は、前記ＣＣＵ７による固体撮像素子２２の読み出しのタイミングや信号処理のタイミングとの同期が取られているので、波長λ１，λ２の帯域幅で得られた蛍光像のみを取り込むことが可能である。そして、前記識別のため、前記観察画像装置２４において、λ１のフィルタ３２と、λ２のフィルタ３３とを透過した像から各々得た信号をＡ／Ｄ変換し、図示しないマルチプレクサで選別して図示しない二つのメモリに各々格納した後、図示しない演算回路で差を取る。前記観察画像装置２４は、前記演算回路で求めた差分量を基に病変部か否かを判別し、病変部の場合例えば色を変えるなどして前記スーパーインポーズ回路２５に出力する。このスーパーインポーズ回路２５によって、前記ＣＣＵ７により処理された通常の画像に、蛍光像を重畳してモニタ１０に表示できる。

[0027]

Since the synchronization with the timing of the reading of the solid-state image sensor 22 and the timing of the signal processing by the above-mentioned CCU7 is used, the above-mentioned observation image apparatus 24 can receive only the fluorescent image obtained by wavelength (lambda)1, (lambda)2 bandwidth. And, in the above-mentioned observation image apparatus 24 for the above-mentioned identification. A / D conversion of each obtained signal is carried out from the image which passed through the (lambda)1 filter 32 and the (lambda)2 filter 33.

It sorts by the multiplexer not illustrated, and is stored in each of two memories not illustrated. A difference is taken in the calculation circuit not illustrated.

The above-mentioned observation image apparatus 24 distinguishes whether it is a disease part on the basis of a difference quantity calculated in the above-mentioned calculation circuit.

It carries out changing in the case of a disease part (for example, colour) etc., and outputs to the above-mentioned superimposition circuit 25.

By this superimposition circuit 25, a fluorescent image is superimposed on the usual image processed by the above-mentioned CCU7, and it can display on monitor 10.

【００２８】
一方、図３（ｂ）に示す回転フィルタ２３は、白黒の固体撮像素子２２に対応したフィルタである。すなわち、この例では、前記回転フィルタ２３に配置したＲ，Ｇ，Ｂフィルタとの組み合わせで、カラー撮像する構成となっている。前記回転フィルタ２３は、波長λ１，λ２の帯域を通過するフィルタ３２，３３と、Ｒ，Ｇ，Ｂの各帯域フィルタとがそれぞれ配置されている。

[0028]
On the one hand, the rotating filter 23 shown in Diagram 3 (b) is a filter corresponding to the monochrome solid-state image sensor 22.

That is, in this example, it is the composition which carries out a colour image pick-up, in the combination with R g, B filters configured in the above-mentioned rotating filter 23.

filters 32 and 33 with which the above-mentioned rotating filter 23 passes through wavelength (lambda)1, (lambda)2 band, and each band filter of R, G, and B are respectively configured.

【００２９】
図４（ｂ）の回転フィルタ２３を用いた場合は、固体撮像素子に白黒のものを用いているので、単板式の固体撮像素子を用いた構成より解像度の向上が期待できる。

[0029]
Since a monochrome solid-state image sensor is used when the rotating filter 23 in diagram 4 (b) is used, the improvement in an image resolution is expectable from the composition using the solid-state image sensor having a single-plate.

【００３０】
前記構成において、まずタイミングコントローラ２６により、外付けカメラ６内の回転フィルタ２３が６０Ｈｚで回転され、これと同期してアダプタ５内の切換えミラー２０も駆動される。１／４×１／６０ｓｅｃの

[0030]
In above-mentioned composition, the rotating filter 23 in the external attachment camera 6 rotates by 60Hz by the timing controller 26 first.

Synchronizing with this, the change mirror 20 in adapter 5 is also actuated.

The light-guide of white light is carried out to LG of the endoscope from the usual light source

間、通常観察用光源装置３から白色光が内視鏡のＬＧに導光され、通常の内視鏡像観察が行われる。そして、残りの３／４×１／６０ｓｅｃの間は、ミラー２０が切換えられ、蛍光観察用光源装置４からレーザ光（励起光）が内視鏡のライトガイド１２に導光される。この励起光が生体に照射され、蛍光が発生する。この蛍光は、波長λ１，λ２の光がそれぞれのフィルタ３２，３３を通して、固体撮像素子２２に入力され、蛍光画像が得られる。前記ＣＣＵ７では、通常画像と蛍光画像とに対応した各映像信号がそれぞれ処理された後に、通常画像はそのままモニタ１０上に表示され、蛍光画像はさらに画像処理回路２４にて擬似カラー化されてモニタ１０上に表示される。すなわち、スーパーインポーズ２５により通常画像と蛍光画像とが重畳されて、モニタ１０に表示される。

device for observation 3 during 1/4*1/60sec, and the usual endoscope image observation is performed.
And, mirror 20 is switched during the 3/4*1/60sec remaining.

The light-guide of the laser light (excitation light) is carried out to the light guide 12 of an endoscope from the fluorescent light source device for observation 4.
These excitation light is irradiated to the organism, and fluorescence occurs.
As for this fluorescence, wavelength (lambda)1, (lambda)2 light passes through each filter 32 and 33.
It is input into a solid-state image sensor 22, and a fluorescent image is obtained.
In above-mentioned CCU7, after respectively processing each video signal corresponding to a usual image and a usual fluorescent image, the usual image is displayed on monitor 10 as it is.

The fluorescent image is further formed into a pseudo colour in the image-processing circuit 24, and is displayed on monitor 10.

That is, superimposition 25 was overlapped by a usual image and a usual fluorescent image, and it displays on monitor 10.

【００３１】
尚、蛍光画像は通常の像に比べて微弱であるため、前記フィルタλ１，λ２の開口面積は大きくしてある。

[0031]
In addition, compared with the usual image, since it is slight, above-mentioned filter (lambda)1, (lambda)2 the opening area is enlarged for the fluorescent image.

【００３２】
本実施例では、従来のものと異

[0032]
In this embodiment, it differs from a

なり、蛍光観察と通常観察との切換えに際して、カメラ等の装置の着脱が不要であり、内視鏡画像と蛍光画像との両方を手間無く容易に得ることができる。

conventional configuration.

In case of the change with fluorescent observation and a fluorescent usual observation, the insertion or removal of apparatuses, such as a camera, is unnecessary, and both endoscope image and fluorescent image can be obtained easily without time wasted.

【００３３】
また、本実施例では、一つの撮像手段で通常画像と蛍光画像が処理できるため、二つの撮像手段を用いたものより構成を簡単にできる。

[0033]
Moreover, in this embodiment, since a usual image and a usual fluorescent image can be processed with one image-pick-up means, composition is simply possible compared with using two image-pick-up means.

【００３４】
また、本実施例は、内視鏡としては、通常のファイバ式光学内視鏡を用いることができ、且つ導入光切換えアダプタを介装するだけで、白色照明光を発する通常の光源装置と所定波長が得られれば通常のレーザ光源とを用いて光源の切換えが容易にできる。

[0034]
Moreover, the usual fibre type optical endoscope can be used for this embodiment as an endoscope.

And only by situating an introduced light change adapter, if the usual light source device and the specified wavelength which emit a white illumination light is obtained, a change of a light source can be easily performed using a usual laser light source.

【００３５】
このように、本実施例は、従来の内視鏡システムとの互換性が得られなくなるという点を克服でき、コスト面からも有利である。

[0035]
Thus, this embodiment can conquer the problem of lacking compatibility with the conventional endoscope system, and it is advantageous also from the cost standpoint.

【００３６】
さらに、本実施例では、通所の

[0036]
Furthermore, in this embodiment, it is the eye-

内視鏡の接眼部に、一つの撮像手段、フィルタ手段及び駆動手段を配置した外付カメラが着脱できるようになっており、この外付けカメラで、時分割に蛍光像及び通常像を撮像できる。

piece part of the ?pass-place? endoscope, one image-pick-up means, the external camera which has configured filter means and actuation means which can be inserted or removed.

With an external camera, a fluorescent image and a fluorescent usual image can be recorded to a time division.

【００３７】

次に、第２実施例について説明する。この第２実施例は、第１実施例と構成は同一であり、その作用が異なっている。このため、図は省略すると共に、異なる作用についてのみ説明する。

[0037]

Next, a second embodiment is demonstrated.

This second embodiment has the same composition as the 1st embodiment.

The effect differs.

For this reason, while omitting a diagram, it demonstrates only the different effects.

【００３８】

通常の内視鏡画像を得る時には、前記タイミングコントローラ２６の制御により、前記回転フィルタ２３が、図４（ａ）に示す白色光を通過させるフィルタ３１を固体撮像素子２２の光路上に配置する。同時に、アダプタ５内の切換えミラー２０を制御して、通常観察用光源装置３から白色光を内視鏡のライトガイド１２に導光するようにする。

[0038]

When obtaining a usual endoscope image, the above-mentioned rotating filter 23 configures filter 31 which passes white light shown in Diagram 4 (a), in the optical path of a solid-state image sensor 22 by the control of the above-mentioned timing controller 26.

Simultaneously, the change mirror 20 in an adapter 5 is controlled.

White light is guided by light guide 12 of an endoscope from the usual light source device for observation 3.

【００３９】

そして、蛍光像を観察する時には、回転フィルタ２３を回転させると共に、切換えミラー２０を制御して、レーザ光をライトガイド１３に導光し、蛍光像を

[0039]

And, when observing a fluorescent image, while rotating the rotating filter 23, the change mirror 20 is controlled.

The light-guide of the laser light is carried out to light guide 13, and a fluorescent image is

観察する。

【００４０】
本実施例では、通常の内視鏡画像と互換性を持たせた外付カメラとすることが可能となる。

【００４１】
図５及び図６は本発明の第３実施例に係り、図５は蛍光観察装置の全体的な構成図、図６は回転フィルタの構成図である。

【００４２】
本第３実施例は、第１実施例の構成に加えて、前記外付カメラ６に蛍光観察スイッチ（ＳＷ）３４を設けてある。また、本実施例は、第１実施例の前記回転フィルタ２３に代えて回転フィルタ２３Ａを設けてある。この回転フィルタ２３は、前記フィルタ３２，３３より開口が大きく、ほぼ半分の割合で占有するフィルタλ１，λ２を配置している。さらに、本実施例では、前記回転フィルタ２３Ａを固体撮像素子２２とイメージガイドファイバ１１との光路上に挿脱する図示しない挿脱手段を設けてある。この挿脱手段は波長選択手段を構成するもので、例えば前記前記回転フィルタ２３Ａを回動自在に結合しているモータ２４を移動させるステージと

observed.

[0040]
In this embodiment, it can consider as the external camera compatible with a usual endoscope image.

[0041]
Fig. 5 and 6 concerns the 3rd embodiment of this invention.

Diagram 5 is an entire block diagram of fluorescent observation apparatus. Diagram 6 is a block diagram of a rotating filter.

[0042]
In addition to the composition of the 1st embodiment, this 3rd embodiment has provided the fluorescent observation switch (SW) 34 on external camera 6.

Moreover, in this embodiment, in place of the above-mentioned rotating filter 23 of the 1st embodiment, rotating filter 23A is provided.

This rotating filter 23 has an opening larger than the above-mentioned filters 32 and 33.

Filter (lambda)1, (lambda) 2 occupying roughly half is configured.

Furthermore, in this embodiment, installation/removal means of a solid-state image sensor 22 and image guide fibre 11 not illustrated to install/remove in the optical path is provided above-mentioned rotating filter 23A.

This installation/removal means constitutes wavelength-selection means.

For example, it can be comprised of the motor and the stage which makes motor 24 which has bonded rotatably above-mentioned

モータとから構成できる。この挿脱手段は、前記蛍光観察スイッチ３４の切換えに応じて、前記ＣＣＵ７からの指示により前記挿脱を行うようになっている。

rotating filter 23A move.

This installation/removal means performs the above-mentioned installation/removal by the above-mentioned indication from CCU7 depending on a change of the above-mentioned fluorescent observation switch 34.

【００４３】
その他、第１実施例と同様の構成及び作用については、同じ符号を付して説明を省略する。

[0043]
In addition, for the same composition and the same effect as the 1st embodiment, the same code is attached and description is omitted.

【００４４】
前記蛍光観察スイッチ３４がＯＮ状態の間は、蛍光観察状態となる。この蛍光観察時には、図６に示す回転フィルタ２３Ａが前記光路上に挿入され回転させると共に、前記固体撮像素子２２の読み出し時間が長くなるように前記ＣＣＵ７によって制御される。

[0044]
During ON states, the above-mentioned fluorescent observation switch 34 will be in fluorescent observation state.

At the time of this fluorescent observation, while rotating filter 23A shown in Diagram 6 is inserted on the above-mentioned optical path and rotates, it controls by the above-mentioned CCU7 so that the reading time of the above-mentioned solid-state image sensor 22 becomes long.

【００４５】
前記蛍光観察スイッチ３４がＯＦＦとなることで、通常観察状態となる。通常の内視鏡画像を観察している時は、１／６０秒毎に固体撮像素子２２の信号を読み出す。一方、前記蛍光観察時には、例えば１秒毎に信号を読み出すようにすることにより微弱な蛍光像も感度良く得ることができる。

[0045]
By the above-mentioned fluorescent observation switch 34 being set to OFF, it becomes a usual observation state.

When observing a usual endoscope image, the signal of a solid-state image sensor 22 is read out every 1 / 60 seconds.

On the one hand, at the time of the above-mentioned fluorescent observation, a slight fluorescent image can also be obtained with a sufficient sensitivity by reading out the signal, for example, every second.

【００４６】
また、前記スイッチ３４をＯＮすると、直前の通常内視鏡像がフリーズされてモニタ１０に表示され、後に前記スイッチ３４がＯＮの間に得られた蛍光像が前記フリーズ画像にスーパーインポーズされてモニタ１０に表示される。

[0046]
Moreover, if the above-mentioned switch 34 is turned on, the last usual endoscope image will be frozen and monitor 10 will display it.

Later, the fluorescent image obtained during ON of the above-mentioned switch 34 superimposes with the above-mentioned frozen image, and is displayed by monitor 10.

【００４７】
本実施例では、蛍光画像と通常画像とを選択的に撮像できる。また、本実施例では、高感度の固体撮像素子と電子シャッタースピードの可変とを組み合わせることにより、蛍光像のより高感度な撮像が実現できる。その他の構成及び作用効果は、第１実施例と同様で、説明を省略する。

[0047]
In this embodiment, a fluorescent image and a fluorescent usual image can be recorded selectively.

Moreover, in this embodiment, by combining the solid-state image sensor of high sensitivity, and variable electronic-shutter speed, imaging the fluorescent image with higher sensitivity is realizable.

Other composition and effects are the same as that of the 1st embodiment, and description is omitted.

【００４８】
図７（ａ）は本発明の第４実施例に係る蛍光観察装置の全体的な構成図である。また、図７（ｂ）は第４実施例の変形例に係る蛍光観察装置の要部を示す構成図である。

[0048]
Diagram 7 (a) is an entire block diagram of the fluorescent observation apparatus based on the 4th embodiment of this invention.

Moreover, Diagram 7 (b) is a block diagram showing the principal part of the fluorescent observation apparatus based on the modification of the 4th embodiment.

【００４９】
本実施例は、第１実施例と異なり光源を切り換える構成が異な

[0049]
This embodiment is different from the 1st embodiment, and the set-up which switches the

っている。すなわち、第１実施例では、切換えミラー２０の駆動により光源を切り換えている。これに対して、本実施例では、励起光と通常観察光とをそれぞれ発光する光源のＯＮ／ＯＦＦと、二股に分岐した同一の光伝達手段とにより光源の切換えを実現している。

light source differs.

That is, in the 1st embodiment, the light source is switched by the driving of the change mirror 20.

While, in this embodiment, by ON/OFF of the light source which respectively emits light in excitation light and a usual observation light, and by splitting the identical optical transfer means, the change of a light source is made possible.

【００５０】

図７（ａ）に示す蛍光観察装置５０は、第１実施例のＣＣＵ７、蛍光画像処理装置８及び制御装置９の機能を併せ持ったＣＣＵ４５を有している。

[0050]

The fluorescent observation apparatus 50 shown in Diagram 7 (a) has CCU45 having function of CCU7 of the 1st embodiment, the fluorescent image processing device 8, and the control apparatus 9.

【００５１】

前記蛍光観察装置５０は、第１実施例の導入光切換えアダプタ５に代えて、導入光切換えアダプタ４６を有している。この導入光切換えアダプタ４６は、前記ユニバーサルコード１５と、前記蛍光観察用光源４及び通常観察用光源３との間に介装される。前記導入光切換えアダプタ４６は、ライトガイドケーブル１９Ａを介して前記蛍光観察用光源（図中には、レーザ光源と記す）４と、またライトガイドケーブル４７を介して前記通常観察用光源（図中には、内視鏡観察用光源と記す）３とに接続される。

[0051]

The above-mentioned fluorescent observation apparatus 50 is replaced with the introduced light change adapter 5 of the 1st embodiment.

It has the introduced light change adapter 46.

This introduced light change adapter 46 is situated between the above-mentioned universal cord 15, and the above-mentioned fluorescent light source for observation 4 and the usual light source for observation 3.

For The above-mentioned introduced light change adapter 46, via light-guide cable 19A, the above-mentioned fluorescent light source for observation 4, (in the drawing(s) it is described as a laser light source), moreover the light-guide cable 47 is minded. it connects with the above-mentioned usual light source for observation 3 (in the drawing(s) it is described

as the light source for an endoscope observation)

【００５２】
その他、第１実施例と同様の構成及び作用については、同じ符号を付して説明を省略すると共に、異なる点に付いてのみ説明する。

[0052]
About the same composition in addition to this and the same effect in addition to this, in relation to the 1st embodiment, the same code is attached and description is omitted, and only different items are described.

【００５３】
前記導入光切換えアダプタ４６は、励起光であるレーザ光と通常観察光とをそれぞれ導入するため、光源側端部が二つに分岐されたライトガイド４８を有し、、それぞれの光を内視鏡側の前記ライトガイド１２に導入するようになっている。

[0053]
The above-mentioned introduced light change adapter 46 has the light guide 48 which the light-source edge part branched in two, in order to respectively introduce the laser light which is excitation light, and the usual observation light.

Each light is introduced into the above-mentioned light guide 12 on the endoscope side.

【００５４】
前記ＣＣＵ４５は、前記モータ２４の制御と共に、これに同期して光源３，４のＯＮ／ＯＦＦを制御している。すなわち、ＣＣＵ４５は制御手段としての機能も有する。

[0054]
Above-mentioned CCU45 is controlling ON/OFF of light sources 3 and 4 with the control of the above-mentioned motor 24 synchronizing with this.

That is, CCU45 also has function as control means.

【００５５】
前記構成において、通常観察時には通常観察用光源３のみをＯＮし、蛍光観察時には、蛍光観察用光源４のみをＯＮにする。前記アダプタ４６内に設けられたライトガイド４８の二つの分岐端からそれぞれ励起光あるい

[0055]
In above-mentioned composition, only the usual light source for observation 3 is turned on at the time of a usual observation.

At the time of fluorescent observation, only the fluorescent light source for observation 4 is turned ON.

Excitation light or a usual observation light is

は通常観察光を導き、内視鏡側のライトガイド１２には時分割で各光が導入される。各像の信号処理等は、第１実施例と同様に構成できる。あるいは、スーパーインポーズ回路に代えて、ビデオスイッチャーを設け、切換え表示をするようにしても良い。

respectively guided from the two branch ends of the light guide 48 provided in the above-mentioned adapter 46.

Each light is introduced into the light guide 12 on the endoscope side by the time division.

The signal processing of each image etc. can be carried out like in the 1st embodiment.

Or, in place of superimposition circuit, a video switcher is provided.

It may be used to change the display.

【００５６】
本実施例では、通常観察光と蛍光観察光との切換えは電気的に行っており、機械的な切換えの構成と比較して、装置の小型化が図り易く、高速の切換えが容易に実現できる。

[0056]
In this embodiment, the change with a usual observation light and fluorescent observation light is performed electrically.

Compared with the composition of a mechanical change, it is easy to attain a size-reduction of the apparatus, and a high-speed change can be made possible easily.

【００５７】
また、本実施例は、内視鏡及び光源装置について既成のものが流用可能である。

[0057]
Moreover, in this embodiment concerning an endoscope and a light source device, an established thing can be reused for a new purpose.

【００５８】
その他の構成及び作用効果は、第１実施例と同様で、説明を省略する。

[0058]
Other composition and effects are the same as that of the 1st embodiment, and description is omitted.

【００５９】
図７（ｂ）に示す第４実施例の変形例は、前記アダプタ４６に代えて、ダイクロイックミラー５２と、ミラー５３とが配置さ

[0059]
The modification of the 4th embodiment shown in Diagram 7 (b) is replaced with the above-mentioned adapter 46.

It has adapter 51 by which the dichroic mirror

れたアダプタ５１を有している。このアダプタ５１は、前記ライトガイド１２とライトガイドケーブル４２とを結ぶ光軸上に、ダイクロイックミラー５２を４５度の角度で配置している。さらに前記アダプタ５１は、前記ライトガイドケーブル１９Ａから出射されるレーザ光が、ダイクロイックミラー５２に向けて前記光軸と直交する方向に反射されるように配置されたミラー５３を有している。このダイクロイックミラー５２は、レーザ光は反射する一方、通常観察光は透過することになる。従って、１本の内視鏡側ライトガイド１２にそれぞれの光が導入できる。

52 and mirror 53 have been configured.

This adapter 51, on the optical axis of above-mentioned light guide 12 and the light-guide cable 42, a dichroic mirror 52 is situated on the angle of 45 degrees.

Furthermore the above-mentioned adapter 51 has mirror 53 configured so that the laser light by which a radiation is carried out may be reflected in the above-mentioned optical axis and the above-mentioned orthogonal direction toward a dichroic mirror 52 from above-mentioned light-guide cable 19A.

While this dichroic mirror 52 reflects a laser light, a usual observation light will be passed through.

Therefore, each light can be introduced into one endoscope side light guide 12.

【００６０】
その他の構成及び作用効果は、第４実施例と同様で、説明を省略する。

[0060]
Other composition and effects are the same as that of the 4th embodiment, and description is omitted.

【００６１】
図８は本発明の第５実施例に係る蛍光観察装置の全体的な構成図である。

[0061]
Diagram 8 is an entire block diagram of the fluorescent observation apparatus based on the 5th embodiment of this invention.

【００６２】
本実施例が第４実施例と異なる点は、前記アダプタ４６を除き、内視鏡側のライトガイドが二股に分岐した構成となっていることにある。そして、本実施例で

[0062]
The end that this embodiment differs from the 4th embodiment, except for The above-mentioned adapter 46, the light guide by the side of an endoscope is the forked composition.

And, in place of the above-mentioned light

は、前記光源３，４に代えて、レーザ光源４３と前記ランプ１７とを内蔵した光源装置４４を有している。

sources 3 and 4 in this embodiment, it has the light source device 44 which built into laser light source 43 and the above-mentioned lamp 17.

【００６３】
図８に示す内視鏡４２は、光伝達手段と導入光選択手段が一体となったライトガイド４１を有している。このライトガイド４１は、ユニバーサルコード１５のコネクタ内においてその端部が二つに分岐されて構成されている。このライトガイド４１の各分岐端は、前記光源装置４４に接続され、前記光源装置４４の前記ランプ１７とレーザ光源４３とが各発した光をそれぞれ入射し、各入射光を内視鏡先端に配置された一つの出射端から出射するようになっている。

[0063]
endoscope 42 shown in Diagram 8 has the light guide 41 with which optical transfer means and introduced light choice means were united.

In the connector of the universal cord 15, the edge part branches this light guide 41 into two. Each branch end of this light guide 41 is connected to the above-mentioned light source device 44.

Incidence of the light which the above-mentioned lamp 17 and the above-mentioned laser light source 43 of the above-mentioned light source device 44 emitted is respectively carried out.

The radiation of each incident light is carried out from one radiation end situated on the end of an endoscope.

【００６４】
前記ランプ１７とレーザ光源４３とは、前記ＣＣＵ４５によりＯＮ／ＯＦＦが制御されるようになっている。撮像処理等は、前記第４実施例と同様である。

[0064]
For above-mentioned lamp 17 and the above-mentioned laser light source 43, oN/OFF is controlled by the above-mentioned CCU45.

The image-pick-up process etc. is the same as that of the 4th above-mentioned embodiment.

【００６５】
本実施例は、第４実施例と異なりアダプタを不要にできる。

[0065]
Unlike the 4th embodiment, this embodiment can make the adapter unnecessary.

【００６６】

[0066]

【発明の効果】
本発明の蛍光観察装置によれば、カメラ等の装置の着脱を不要とし、その手間が省けると共に、内視鏡画像と蛍光画像との両方を容易に得ることができるという効果がある。

[EFFECT OF THE INVENTION]
According to the fluorescent observation apparatus of this invention, insertion or removal of apparatuses, such as a camera, is made unnecessary.

Time is saved, and both endoscope images and fluorescent images can be obtained easily.

The above-mentioned effect is expectable.

【図面の簡単な説明】

[BRIEF EXPLANATION OF DRAWINGS]

【図１】
図１ないし図は第１実施例に係り、図１は蛍光観察装置の全体的な構成図。

[FIGURE 1]
diagram 1 or a diagram concerns the 1st embodiment.

Diagram 1 is an entire block diagram of fluorescent observation apparatus.

【図２】
図２は正常部位と病変部位との蛍光特性の違いを示す特性図。

[FIGURE 2]
Diagram 2 is a characteristic view showing the difference of the fluorescent characteristic of a normal site and a disease site.

【図３】
図３はフィルタの透過特性と波長λ１，λ２の関係を示す説明図。

[FIGURE 3]
Diagram 3 shows the wavelength (lambda)1, (lambda)2 and permeation characteristic of a filter relationship, and an explanatory drawing.

【図４】
図４は回転フィルタの構成図。

[FIGURE 4]
Diagram 4 is a block diagram of a rotating filter.

【図５】
図５及び図６は第３実施例に係り、図５は蛍光観察装置の全体

[FIGURE 5]
Fig. 5 and 6 concerns the 3rd embodiment.

Diagram 5 is an entire block diagram of

的な構成図。

fluorescent observation apparatus.

【図６】
図６は回転フィルタの構成図。

[FIGURE 6]
Diagram 6 is a block diagram of a rotating filter.

【図７】
図７（ａ）は第４実施例に係る蛍光観察装置の全体的な構成図、図７（ｂ）は第４実施例の変形例に係る蛍光観察装置の要部を示す構成図。

[FIGURE 7]
Diagram 7 (a) is an entire block diagram of the fluorescent observation apparatus based on the 4th embodiment. Diagram 7 (b) is a block diagram showing the principal part of the fluorescent observation apparatus based on the modification of the 4th embodiment.

【図８】
図８は第５実施例に係る蛍光観察装置の全体的な構成図。

[FIGURE 8]
Diagram 8 is an entire block diagram of the fluorescent observation apparatus based on the 5th embodiment.

【符号の説明】
１…蛍光観察装置
２…内視鏡
１１…イメージガイド
１２…ライトガイド
３…通常観察用光源装置
４…蛍光観察用光源装置
５…導入光切換えアダプタ
２０…切換えミラー
２１…ドライバ
６…外付けカメラ
２２…固体撮像素子
２３…回転フィルタ
２４…モータ
７…ＣＣＵ
８…蛍光画像処理装置
９…制御装置
２６…タイミングコントローラ

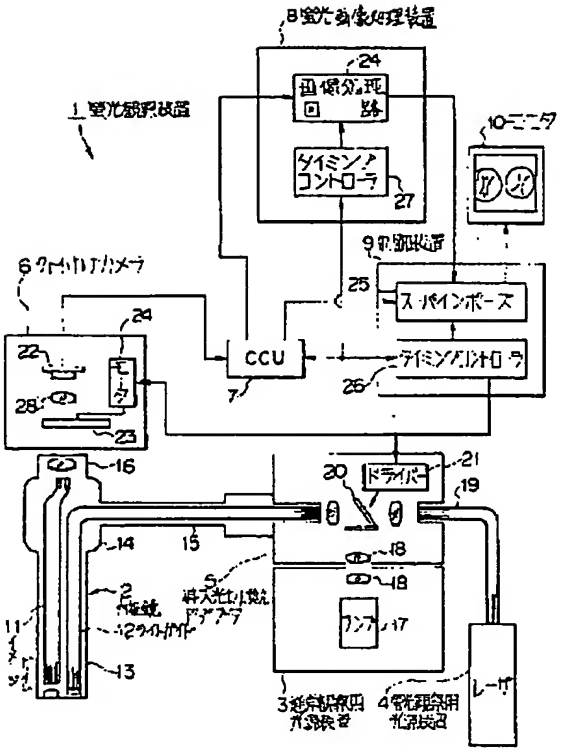
[EXPLANATION OF DRAWING]
1... fluorescence observation apparatus
2... endoscope
11... image guide
12... light guide
3... Usual light source device for observation
4... Fluorescent light source device for observation
5... introduction light change adapter
20... change mirror
21... driver
6... External camera
22... solid-state image sensor
23... rotating filter
24... motor
7...CCU
8... fluorescence image processing device
9... control apparatus

１０…モニタ

26... timing controller
10... monitor

【図１】

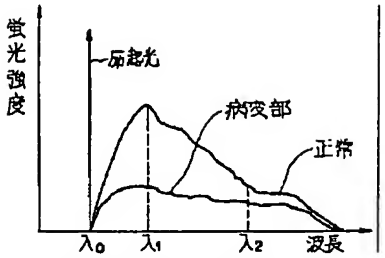
[FIGURE 1]



[translation of Japanese text in Figure 1]
also refer to EXPLANATION OF DRAWINGS
24 (in 8) image processor
27 timing controller

【図２】

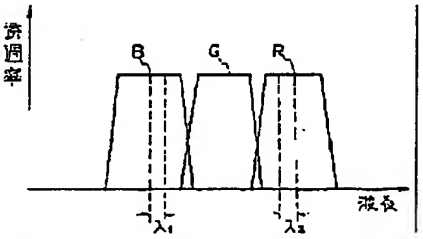
[FIGURE 2]



[translation of Japanese text in Figure 2]

vertical axis: fluorescent intensity
horizontal axis: wavelength
at (lambda) 0 excitation light
top line normal region*:*
bottom line: diseased region

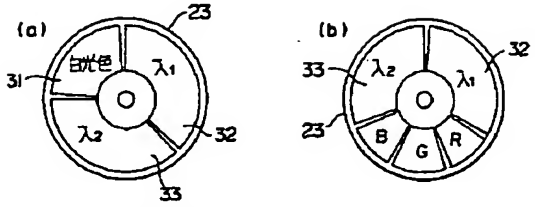
【図３】 **[FIGURE 3]**



[translation of Japanese text in Figure 3]

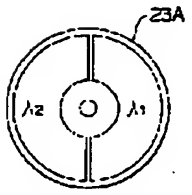
vertical axis: permeation rate
horizontal axis: wavelength

【図４】 **[FIGURE 4]**

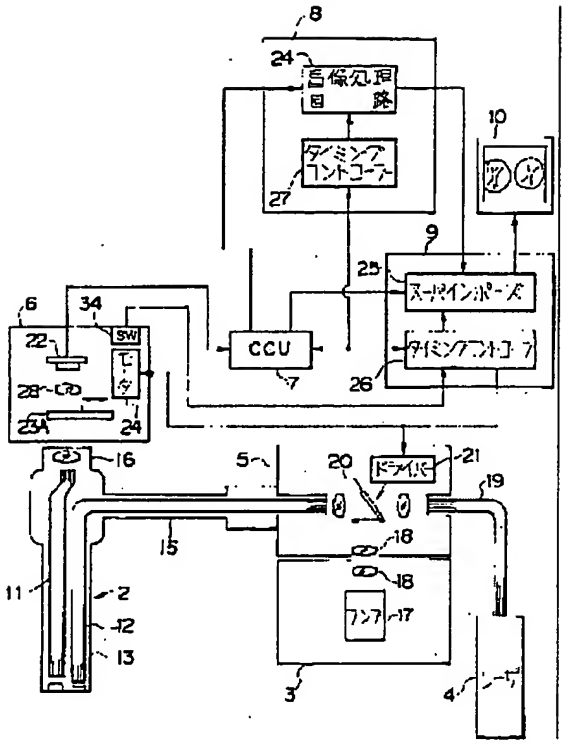


[translation of Japanese text in Figure 4]
in (a) white light

【図６】 **[FIGURE 6]**



【図５】 **[FIGURE 5]**



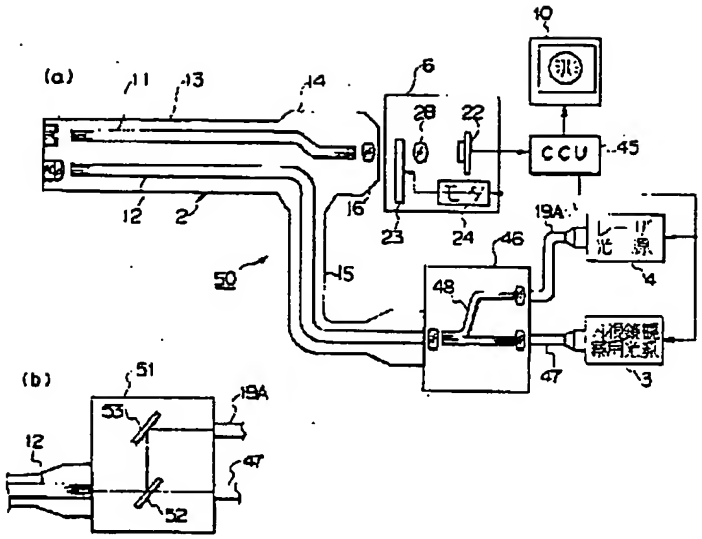
[translation of Japanese text in Figure 5]

17 lamp

24 (in 8) image processor

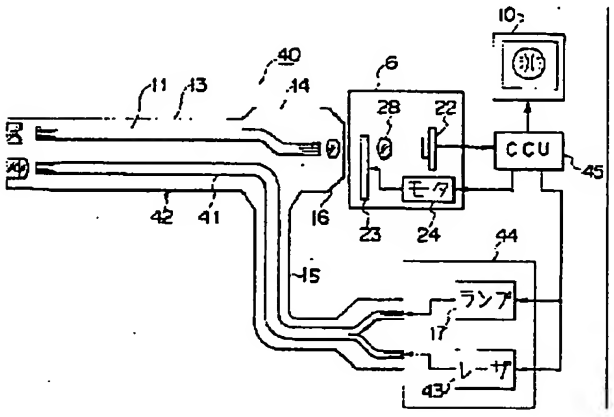
25 superimpose

【図７】 **[FIGURE 7]**



【図８】

[FIGURE 8]



[translation of Japanese text in Figure 8]

17 lamp

43 laser